case the "neuron" terminology, as introduced by Waldeyer, has taken deep root in neurology.

Langley's article on the sympathetic and allied nervous systems is a masterly summary of a subject which, by his researches, he has made peculiarly his own, and groups up in an easily accessible form the many scattered observations on this subject.

The important topic of the "Cerebral Cortex" is fully dealt with by the editor. In mentioning the old experiment of Kircher, known as the "experimentum mirabile," it is set down to "Kirscher" (p. 712). Several of the illustrations are acknowledged from the well-known work of François-Franck and Pitres. The author deprecates the use of the term "sensori-motor," as applied to denote the so-called "motor" or excitable centres in the Rolandic area, although he does not object to the term "psycho-motor" applied to them. A difficult subject is dealt with in a terse but comprehensive manner.

Sherrington's article on the spinal cord displays a mastery of his subject which at once elicits one's admiration. Necessarily, in dealing with the mass of detail many new terms have to be coined for the numerous phenomena which have been discovered in recent years. There is a due admixture of the historical with the results of recent research. What the Germans call Bell's law appears here as "Bell-Magendie law." The word "Bahnung," introduced by Exner into nerve physiology, is, we think, better rendered by "facilitation," adopted by Sherrington, than any of the other proposed equivalents we have seen.

It is evident that a large amount of industrious application has been expended by Sherrington on his articles on "Cutaneous Sensations" and on "Muscular Sense." In the former we find the recent work of Goldscheider, v. Frey and Kiesow treated with ample detail; but perhaps the article on the "muscular sense," grouping up as it does the numerous stray observations, will attract much attention. The value of Sherrington's own work on the "Muscle-spindles," which he showed degenerated after section of the posterior nerve roots outside the spinal ganglion, laid the basis of a more definite physiology regarding the important part played by certain afferent impulses from striped muscle in regulating the activities of the parts from which they proceed. Indeed, the chapter on "the peripheral apparatus of the muscular sense," though short, is an excellent *résumé* of the present knowledge of this important subject, and to which clinicians will find it profitable to devote their attention.

The essay on "Vision" is somewhat unequal, but how can it be otherwise on a subject so vast and which is treated with such wealth of detail in Hermann's "Handbuch der Physiologie."

Although necessarily there is much comparative physiology scattered throughout its pages, we could have wished to see the main facts of the comparative physiology of at least some of the subjects summarised in separate chapters. The work is one which reflects great credit on British physiologists, and we heartily congratulate the editor on its production—a work which must have entailed great labour and careful supervision. Perhaps when the next edition is called for it may be issued in three volumes, as volume ii. has reached rather bulky dimensions.

THE ROYAL OBSERVATORY, GREENWICH.

The Royal Observatory, Greenwich; its History and Work. By E. W. Maunder. Pp. 320. (London: the Religious Tract Society, 1900.)

THE history of the Royal Observatory extends over two centuries and a quarter, and its work is certainly not lacking in general interest; yet Mr. Maunder seems to be the first person to produce a popular account of them, and he has left little room for improvement to any one who comes after him in the near future. The history occupies the first 124 pages of the book in five chapters, and the description of the place as it is to-day, and the work as it is now going on, occupy the other 192 pages in eight chapters. This is probably a fair arrangement. Those who would have liked a little more of the history can find it in such works as Bailey's "Life of Flamsteed," or Rigaud's "Life of Bradley.' A "Life of Halley," on a scale worthy of him, has long been wanted, and has several times been nearly undertaken, but the project has, for one reason or another, always fallen through.

The predecessors of the present Astronomer Royal number seven: Flamsteed, Halley, Bradley, Bliss, Maskelyne, Pond, Airy. Of these Bliss only filled the position for two years; but the others lived long and worked hard at their posts, Flamsteed, Maskelyne and Airy for nearly half a century each; Halley, Bradley and Pond for nearly a quarter. And though there is so much straightforward routine work in astronomy, especially at a national observatory (and among national observatories, especially at Greenwich), yet the names of the Astronomers Royal are all associated with one or two notable events, often, though not always, special achievements of their own. The name of Flamsteed calls up at once the foundation of the observatory (which was in great measure due to him), and unfortunately also the quarrel with Newton; that of Halley, the publication of the Principia, and the first prediction of the return of a comet; that of Bradley, the discovery of Aberration and Nutation, as well as his fine catalogue of stars; that of Maskelyne, the invention of lunar distances and the chronometer, and the establishment of the *Nautical Almanac*. Airy deserves to be remembered as the man who first suggested how to compensate the compass in iron ships, though, like Flamsteed, he was unfortunate enough to leave another reputation, from his attitude towards the discovery of Neptune. Pond and Bliss are something of exceptions; but the former has recently been eulogised by Mr. Chandler as a phenomenal observer; and even of Bliss we may say that it was a distinct achievement to leave behind him only one authentic portrait, and that scratched by a boon-companion on a pewter-flagon! The seven Astronomers Royal were not only men of ability, who worked hard, but men of clear-cut individuality; and their average length of life was nearer four score years than three score years and ten. We ought to have all their portraits in our National Portrait Gallery, including an electrotype of that curiosity inscribed "This sure is Bliss, if Bliss on earth there be."

Mr. Maunder has given us the main facts of these interesting lives in a thoroughly readable form. He then passes on to the Observatory as it is now, and we must

not forget that its present size and arrangement are due, not only to the seven men mentioned above, but also to nineteen years' work from Mr. Christie, the present Astronomer Royal. In these nineteen years he has contributed to the buildings and equipment about as much as his seven predecessors together. There is a new transit-circle, which can be used on or off the meridian; the 13-inch refractor has been increased and multiplied into a 28-inch visual refractor, a 26-inch photographic refractor, and a 30-inch reflector, besides the 13-inch astrographic equatorial; and a large, commodious building has been erected, which more than doubles the space available for computing, measuring photographs, and all the miscellaneous duties of which the lay-mind has probably never imagined the existence. In this noble extension of our National Observatory, the Astronomer Royal has been generously helped by others, and especially by Sir Henry Thompson, who gave two of the large telescopes, and by Mr. Crisp, the architect of the new buildings, whose name we are sorry not to find in Mr. Maunder's book.

On one day in the year, "Visitation Day," the Observatory is devoted to visitors; and though it is not even then thrown open to the public, those with a definite interest in astronomy can generally obtain a card of admission. They find a great many things to see—those who see them for the first time find the number and variety almost bewildering; there is, in fact, the year's work of fifty busy people to look at, as well as the complicated instruments with which it was done. Things have changed somewhat, in spite of the reluctance of economical Governments, since Flamsteed was installed as Astronomer Royal in 1676 with a salary of 100*l.* a year, a "surly labourer" to help him, and no instruments! To such as are fortunate enough to be admitted on these annual occasions we can recommend the later chapters of the book for perusal both before they go and after they come away; a number of technical matters are described in a thoroughly attractive way.

Sometimes in reading a book a stray sentence or two impress the memory, though they may be only incidental to the main theme. Pond's notion of the kind of man who would make a good assistant in an observatory arrests the attention:—

"I want indefatigable, hard-working, and, above all, obedient drudges (for so I must call them, although they are drudges of a superior order), men who will be contented to pass half their day in using their hands and eyes in the mechanical act of observing, and the remainder of it in the dull process of calculation."

There is undoubtedly a vast amount of drudgery in astronomy, if people choose to so regard it. Other sciences multiply their observations ten or a hundred times; the astronomer deals in thousands and even millions. But men with the spirit of drudges, as Mr. Maunder truly remarks, cannot be trusted to do the work honourably and therefore accurately; and besides this the work is *not* drudgery. Mechanical it may be, but good men and true have found it far from dull. Did Herschel find it dull to pass the whole heavens in review star by star? Does Mr. Denning, of Bristol, find it dull to watch night after night for long hours on the chance of observing a few meteor-tracks, and that after a day's business toil? If it were drudgery they would have stopped, but Herschel went on, and Mr. Denning goes on, and these are only two random instances out of hundreds.

At the same time Pond put his finger on a real difficulty, which is just as pressing to-day, nay, far more pressing since the introduction of photography into astronomy has so enormously increased the work. How are we to get through this work? The army of astronomers is so small; it has not been recruited with sufficient rapidity to keep pace with the extension of our Empire. Pond thought of drudges, as commanders of old employed mercenaries: both found them unsatisfactory. What is the real solution? Conscription will scarcely work here. Will the volunteers solve the difficulty, or may we hope for a big reorganisation scheme? H. H. T.

THE MANAGEMENT OF ROADS.

Road-making and Maintenance: a Practical Treatise for Engineers, Surveyors and Others. By Thomas Aitken, Ass.M.Inst.C.E. Pp. xvi + 440. With numerous plates and illustrations. (London: Charles Griffin and Co., Ltd., 1900.)

SINCE the introduction of bicycles and motor-cars the question of road maintenance has come very much to the front. It formed one of the subjects discussed in Section G at the late meeting of the British Association, and was considered of sufficient importance to warrant the appointment of a committee to inquire generally into the subject, but more especially as to the effect of the condition of the surface of roads on the tractive force required to move vehicles along them.

The author of the book under notice has given an interesting account of the history of road-making from the time of the ancient inhabitants of Peru, and of the Romans, to the days of road revival in this country, when General Wade was employed by the Government in constructing about 250 miles of roads through the Highlands of Scotland as the most effectual means of putting an end to the Rebellion of 1715.

Then followed the establishment of turnpike trusts, no less than 1100 Acts of Parliament having been passed for this purpose, and a very large amount of capital was raised for opening out new, or improving old, roads. In this work Telford, the father of modern civil engineering, constructed over 900 miles at a cost of nearly half a million of money. So great was the revolution in the condition of the roads that Macadam, another of the great road-makers, was described as being regarded by the public as a sort of magician, and his invention something preternatural. As the result of their work it became possible to run stage coaches between the principal centres of population at the rate of ten miles an hour. The establishment of railways and the termination of the turnpike trusts under provisions contained in the Acts of Parliament led to the decadence of the main roads of the country, the management of the old turnpikes having reverted to the parochial surveyors. A certain amount of improvement took place when the system of grants out of the county rates towards the maintenance of the main lines of communication was introduced, these